

Subject Area: (6) Navy Environment: Health Effects of Asbestos Exposure Among Pearl Harbor Naval Shipyard Workers. (U)

A. INTRODUCTION

This report updates our progress in this study, discusses our plans for the next fiscal year, and includes a proposed budget for the period

Repl. to 1 November 1978-31 October 1979.

B. SUMMARY OF PROGRESS

1. Status Report

A recent progress report was submitted on 4 May 1978. This report summarized the results of our current analyses on the retrospective cohort. The essential findings were a relative risk of 2.0 for lung cancer among exposed men followed for at least 20 years, and no significant excess risk for other cancer sites. Non-exposed workers showed no significant excess cancer risks. A copy of that report is included here as Appendix A.

Since submitting that report, we have been rechecking our analyses prior to preparing a manuscript for publication. We have found that our data tape for mortality in the general population has a deletion of some of the deaths for accidental causes. Thus, the finding of an excess of accidental deaths (including suicide) in our shipyard cohort should be disregarded at this time. We are redoing that analysis now.

2. Survey of Smoking Habits in the Prospective Cohort

During the present contract year, a major effort was made to complete the collection of smoking history data from both present and past shipyard workers. Such data are essential if we are to truly assess lung cancer risks attributable to asbestos exposure alone. The smoking histories were obtained by means of a questionnaire (Appendix B) which was administered to each man whom we identified as alive and residing in Hawaii on January 1, 1977. This group constitutes our prospective cohort.

a. Determination of members in prospective cohort

In previous follow-up surveillance of the total 9,570 subjects in the retrospective cohort, we determined that 981 men were deceased and about 1,178 had exited from the State of Hawaii. The location and/or status of the remaining 7,411 needed to be determined.

By intensive letter and telephone search, we found an additional 301 subjects living out of state, resulting in a total of 15% out-of-state migrants. In 44 cases, we discovered this fact only after we received a response to the questionnaire from another state. 239 of the subjects, known alive in Hawaii in 1974 and updated, remain lost with respect to current status and location; some of these may be discovered later to belong to the prospective cohort. Having excluded deaths, out-of-state migrants and the lost, we identified 6,871 members in the prospective cohort (or 72% of the original cohort) (see Table 1). About 40% are currently employed at the Pearl Harbor Naval Shipyard.

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University of Hawaii at Manoa Cancer Center of Hawaii
Honolulu, Hawaii

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Table 1

Determination of the Prospective Cohort

	<u>Number</u>	<u>Percent</u>
Subjects Included in Prospective Cohort Living/Residing in Hawaii on 01/01/77	6,871	71.8
Subjects Undetermined Status/Location Lost between 1974-77	239	2.5
Subjects Excluded from Prospective Cohort Deceased prior to 01/01/77	981	10.3
Location out-of-state prior to 01/01/77	1,479	15.4
Total Subjects in Original Cohort	9,570	100.0

b. Response to Contact Efforts

Over 98% of the total 6,871 subjects in the prospective cohort were contacted by letter or telephone for personal information on their smoking habits. Contact attempts were incomplete in the remaining 2% because 26 subjects had died before receiving all the letters and the other 103 subjects with transient addresses were reached through a third party. The results of those contacted successfully are shown in Table 2.

Table 2

Overall Response to Contact Efforts

Subjects contacted successfully	6,744 (98% of total cohort)
Responses	5,730 (85.0%)
Refusals	247 (3.7%)
No Reply	767 (11.4%)

Non-respondents were contacted repeatedly, at least five times. Those who at first stated they were not interested were encouraged to respond, and often did. When mailed letters were returned unopened and with a postal service stamp: "addressee unknown" or "moved, not forwardable", these letters were sent again to the same address if it seemed correct. Occasionally, some got through; more often, the address was incorrect or questionable and the correct one was found.

Contact of past employees began in January of 1977 and six months later, after 3 repeated mail contacts and only a total 53% response rate, we decided to conduct telephone interviews with all those non-respondents with available telephone numbers. In the next six-month period, telephone contacts alone increased the response rate to 89.1% (Table 3). Those subjects unable to be contacted by telephone received a fourth repeat letter in the mail; 3.4% responded. Thus, at the end of 1977, the total response rate reached 92.5% for the past employees.

Table 3

Response of Past Employees to Contact Efforts

	<u>Total Contacted</u>	<u>No. Responses</u>	<u>% Response</u>	<u>Cumulative % Response</u>
1st Mailing	3,806	887	23.3	23.3
2nd "	2,919	846	29.0	45.5
3rd "	2,073	303	14.6	53.5
Telephone	1,770	1,353	76.4	89.0
4th Mailing	417	133	31.9	92.5
TOTAL		3,522		

Contact of the current employees began in July, 1977, with delivery of 2,938 personally addressed letters to the shipyard shops. Stamped, self-addressed, return envelopes were enclosed. While the response rate after two contacts was 65% (Table 4), it was less than we expected from such an accessible group. Officials at Pearl Harbor were helpful from the very beginning in urging and reminding workers to cooperate. In the third contact, we issued a list of the non-respondents' names to the shops along with directives urging workers to state either way their decision about participation. Many stated a wish not to participate and only 23 responded.

Since participation is voluntary, the decision by current workers about participation could have been influenced by peer and supervisor pressure usual at one's workplace. Also, lists of names are not as convenient as letters in hand, which contain questionnaires ready to be filled out and returned in post-paid envelopes. For these reasons, we followed the three shop contacts with one mailing of questionnaires to the homes of the workers. We were surprised to get an additional 276 responses (9.4%), bringing the total response rate up to 75.2%.

A list of names was also given to the union officials as our final contact. They had heard about the slow response we were getting and wanted to help. However, their efforts which began in the first months of 1978, soon had

to be aborted amid the rising publicity surrounding HEW's asbestos hazards pronouncements.

Table 4

Response of Present Employees to Contact Efforts

	<u>Total Contacted</u>	<u>No. Responses</u>	<u>% Response</u>	<u>Cumulative % Response</u>
1st shop (letter)	2,938	1,409	48.0	48.0
2nd shop "	1,529	500	32.7	65.0
3rd shop (PH list)	1,029	23	2.2	65.8
Mailing to home	1,006	276	27.4	75.2
4th shop (union list)	730	0	0.0	75.2
TOTAL		2,208		

(Actually, we were fortunate to obtain an overall response rate of 83% from the group of past and present workers in the course of one calendar year, and to have completed this collection prior to the changes occurring with the rising publicity. We had deliberately chosen to conduct this survey on a low key basis without any prior public advertising.)

c. Smoking History Results and Their Application to the Retrospective Cohort Analysis

The lifetable method of analysis which we are utilizing in this study uses the stable rates in the general population to compute expected numbers in the occupational cohort, in sex-, race-, age- and calendar period-specific categories. An assumption in applying this methodology is that the occupational cohort is not different from the general population with respect to other factors that may be related to the disease outcome. The outstanding confounding factor with regard to our study is smoking habits; our retrospective cohort analysis assumes that these habits are similar in the two groups.

As a result of our collecting smoking histories from the current Hawaii members of our cohort, together with data which we have collected independently from a large, representative sample of the population of Hawaii, we are now able to make some comments on the reasonableness of that assumption. Table 5 below shows current and past smoking rates in three groups of men: exposed workers at PHNS, non-exposed workers at PHNS and the general population of Hawaii, in ethnic-specific groupings. In general, the data show very good agreement among all groups. More men in the general population are current smokers, perhaps because more shipyard workers have recently quit smoking in response to publicity about the adverse effects of smoking when combined with asbestos exposure.

Table 5

Comparison of Smoking Patterns among Shipyard Workers
and the General Population of Hawaii

Race	Comparison Group	% Current Smokers(1)	% Ex-Smokers (2)	% Ever Smoked(1+2)	Lifetime Use* among Smokers (pack-yrs)
Caucasian	Population Survey	44.5	16.3	60.8	27.3
	Shipyard: exposed non-exposed	32.4 28.9	35.7 38.9	68.1 67.8	21.2 19.7
Japanese	Population Survey	39.4	17.4	56.8	21.7
	Shipyard: exposed non-exposed	36.3 30.6	33.9 35.6	70.2 66.2	18.2 21.4
Chinese	Population Survey	22.9	16.1	39.0	17.9
	Shipyard: exposed non-exposed	19.6 17.3	25.8 23.5	45.4 40.8	19.0 21.9
Hawaiian	Population Survey	48.5	10.6	59.1	23.0
	Shipyard: exposed non-exposed	35.8 30.0	21.8 30.4	57.6 60.4	21.8 21.3
Filipino	Population Survey	32.4	11.4	43.8	17.7
	Shipyard: exposed non-exposed	31.8 22.7	26.1 34.1	57.9 56.8	21.1 21.8

*Age-adjusted to the standard world population from Cancer Incidence in Five Continents, Vol. III, 1976

If current and ex-smokers are combined, the rates are more similar, though the tendency is for fewer smokers among the general population. However, among smokers, the lifetime cigarette use varies less in the three groups. Caucasians show the greatest discrepancy, but the nature of this difference is such that it would lead us to overestimate the expected numbers of lung cancers in the shipyard workers, which would make the observed risk ratios conservative ones.

d. Possible Biases in the Smoking Data

There are some potential biases in these data which could explain the observed differences between the general population and the shipyard workers:

1) Shipyard workers may underestimate their use of cigarettes because of recent publicity regarding the adverse health effects from asbestos exposure, particularly when combined with smoking. (The reason for minimizing cigarette use in their responses would be to protect themselves for future compensation claims against the Navy.)

We have no way to prove the existence or non-existence of this bias. However, the fact that the smoking histories from the non-exposed group (who presumably would not have, or would have less of, this concern) are very similar to those from the exposed workers suggests that this bias is unlikely.

2) Smoking data were obtained by both mailed questionnaire and telephone interview from the shipyard workers, and by direct interview and telephone interview from the sample of the general population. If the reliability of the information obtained varies by these three methods, the validity of our comparison could be questioned. If the proportion of telephone interviews in the two groups were the same, then any unreliability associated with this method would be equally distributed in both groups; however, we don't have information on the proportion of telephone interviews for the sample of the general population.

From our data, we are able to compare the results of the questionnaire vs. telephone methods of obtaining smoking histories. Such an analysis is currently in progress. If we find that the data are similar by both of these methods, we will have some basis for confidence that this potential bias is not an important consideration in our data.

C. PLANS FOR THE NEXT CONTRACT PERIOD

1. Updated Analysis on the Retrospective Cohort

The analysis just completed on this cohort carried us up to 1974, which allowed a maximum followup of 24 years on the members of our cohort. As is well known, the effects from asbestos exposure frequently do not manifest themselves for much longer intervals. It is thus very important that we continue our followup on this group.

We are now in an excellent position to extend the followup period for the entire retrospective cohort an additional 5 years, to January 1, 1979,

since the followup for vital status is fairly current for everyone except about 1,600 subjects who out-migrated (mainly to the U.S. mainland). Ascertainment of vital status for those out-migrants will be accomplished through the usual sources: S. S. Administration, Veterans' Administration, other shipyard personnel records, etc. Negotiations will be made with these agencies to match our records around March of 1979, when their 1978 records are expected to be fairly complete. Meanwhile, the vital status on the local subjects will be updated to the new common closing date using the necessary available local sources for followup. A new local source, the voters' registration lists, with current information for the 1978 gubernatorial election, will aid in locating whereabouts of some of the hardcore lost.

We will have an opportunity, also, to test out the efficiency of a computer linkage system of our records with death records in the Department of Health, since we will be depending more on this method of following up locally-occurring deaths in the prospective cohort. While a computer linkage system with the Department of Health records will help greatly, supplemented hand checks will insure a complete search for all recorded deaths.

Once we have completed updating vital status on the entire cohort for the extended 5-year followup period, we will carry out a mortality analysis similar to the one just completed on the same two comparison groups: those exposed and those not exposed to asbestos. This should be accomplished by the end of the next contract year.

2. Followup on the Prospective Cohort

The prospective cohort of 6,871 men is now established, as described previously. It will take several years to accumulate sufficient numbers of cases of cancer in this group in order to carry out analyses for the effects of asbestos exposure and smoking. Yet, followup must be maintained on an ongoing basis, and this will be continued during the next year. Since the retrospective and prospective cohorts overlap completely, followup on the one serves as followup on the other. Thus, we do not have to maintain two separate following activities. However, we will be determining incidence cases for the prospective group, using the Hawaii Tumor Registry, rather than mortality cases only as in the retrospective group. Identification of incidence cases will be accomplished by computer matching of our data file against the file of the Hawaii Tumor Registry. Additional active followup will identify incidence cases among those few members of the cohort who leave Hawaii during the study period.

For our ongoing followup surveillance, we have a manually operated card system of confidential personal information on each subject which is kept current with addresses/telephone numbers of subjects, parents, wives, and other relatives, current place of employment, and sundry other identifying personal information. While out-migration rates of regular or retired workers seem low, intra-state mobility is fairly high and requires continual surveillance to keep track of the subjects. Thus, our major efforts for this contract year will be directed towards: 1) establishing the followup surveillance system for the prospective cohort, and 2) updating to January 1979 the vital status of the entire retrospective cohort for an extended mortality analysis.

3. Confirmation of Cancer Diagnosis

We have made arrangements with Dr. John Lockett of Straub Clinic and Hospital to review tissue specimens from all lung cancer and mesothelioma cases in the prospective cohort. This will serve to confirm the diagnoses in these cases and to provide comparisons between the histologic findings among cases in the exposed and non-exposed groups.

4. Further Analyses of Smoking Survey Response

By persistence in contacting, we were able to achieve an 83% response rate from the members of the prospective cohort. All non-responding subjects were reached a minimum of 5 times. While such a high response rate is a desirable goal, it is costly in terms of time, materials and manpower. Yet, failure to achieve such a high rate may introduce a selection bias if cigarette smokers differ from non-smokers in their response rates. Seltzer et al (Amer. J. Epidemiol. 100:453-457, 1974) found smokers to respond at a lower rate than non-smokers to a mailed smoking history questionnaire "especially if no special effort is made to obtain their response through reminders or repeated mailings". For each respondent in our cohort, we have data on how the information was obtained and on which contact attempt. We plan to analyze these data to see how such a selection bias would have affected the results if we had chosen to terminate our contact efforts earlier. Also, we can compare the three different methods of contact: mailing, delivery at place of work, and telephoning. The results of our experience may be beneficial to other scientists involved in similar projects.

5. Summary of Plans

Our plans for the next year include:

- 1) Publication of the results of the retrospective cohort analysis to 01/01/74.
- 2) Extended followup and analysis on the retrospective cohort to 01/01/79.
- 3) Establishing and maintaining followup surveillance on the prospective cohort.
- 4) Testing and using mortality/morbidity computer linkages with the Department of Health and the Hawaii Tumor Registry computer tapes.
- 5) Histological confirmation of new cases of lung cancer/mesothelioma.
- 6) Further analysis of the smoking history data, including an examination of survey response by smoking status.

D. LOCAL SUPPORT FOR OUR STUDY

We must again mention the tremendous help and support we have had in this study from shipyard personnel, including the Commanding Officer, Mr. Jerome Cook and his staff in IRO, Union Officials Brian Ho and Benjamin Toyama, and Capt. Francis Viola III. While recent publicity stimulated interest in the asbestos problem, it also produced confusion. However, through consolidated

efforts on everyone's part, a better understanding of our project's objectives and scope has been achieved. As a result, there seems to be more open interest in cooperating in future efforts. In sum, the good rapport we had established with both subjects and officials has continued.

E. HUMAN SUBJECTS

Approval of the design and conduct of this study has been obtained from the Committee on Human Experimentation of the University of Hawaii, which operates under DHEW guidelines. An annual review of this study by the Committee on Human Experimentation will take place in September, 1978. Notification of continued approval will be made to ONR after it is received from the committee.

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